

What is claimed is:

1. A curable composition comprising at least one polycarboxy-functionalized prepolymer having the structure $R^1[-X-C(=O)-Cy(CO_2H)_q]_n[-X-C(=O)-R^3-CO_2H]_p[X-H]_{m-(n+p)}$, or at least one reaction product of said polycarboxy-functionalized prepolymer with at least one epoxy resin, or a mixture thereof, wherein R^1 is the m-valent radical of an elastomeric polymer, X is $-O-$, $-S-$, or $-NR^2-$, Cy is an aromatic or aliphatic ring, R^2 is H or a C_1-C_6 alkyl group, R^3 is a radical containing at least one carbon-carbon double bond, m is an integer from 2 to 6, n is an integer from 1 to 6, p is 0 or an integer from 1 to 5, m is greater than or equal to n + p, and q is an integer of at least 2.
2. A composition as claimed in claim 1 additionally comprising at least one polymer having at least one glass transition temperature of -30°C or lower and epoxy-reactive groups, or at least one reaction product of said polymer with at least one epoxy resin, or a mixture thereof
3. A composition as claimed in claim 2 comprising at least one polymer based on 1,3-butadiene.
4. A composition as claimed in claim 2 comprising at least one polymer selected from the group consisting of carboxy-functionalized butadiene/acrylonitrile copolymers, butadiene/(meth)acrylic acid ester copolymers, carboxy-functionalized butadiene/acrylonitrile/styrene copolymers and butadiene/(meth)acrylate/styrene copolymers and epoxy resin adducts thereof.
5. A composition as claimed in claim 2 comprising at least one polymer selected from the group consisting of carboxy-functionalized butadiene/acrylonitrile copolymers and adducts of carboxy-functionalized butadiene/acrylonitrile copolymers and polyglycidyl ethers of bisphenols.

6. A composition as claimed in claim 1 wherein said at least one polycarboxy-functionalized prepolymer is produced by a reaction between:

(a) at least one carboxylic anhydride selected from the group consisting of 1,2,3-benzenetricarboxylic anhydride, 1,2,4-benzenetricarboxylic anhydride, monoesters of pyromellitic monoanhydride, monoamides of pyromellitic monoanhydride, 1,4,5-naphthalenetricarboxylic anhydride, 2,3,5-naphthalenetricarboxylic anhydride, 2,3,6-naphthalenetricarboxylic anhydride, pyromellitic mono- and dianhydride, 1,8:4,5- and 2,3:6,7-naphthalenetetracarboxylic mono- and dianhydride, perylenetetracarboxylic mono- and dianhydride, biphenyltetracarboxylic mono- and dianhydride, diphenyl ether tetracarboxylic mono- and dianhydride, diphenylmethanetetracarboxylic mono- and dianhydride, 2,2-diphenylpropanetetracarboxylic mono- and dianhydride, benzophenonetetracarboxylic mono- and dianhydride, and diphenyl sulfone tetracarboxylic mono- and dianhydride; and

(b) at least one polyamine selected from the group consisting of polyalkylene glycol diamines and triamines, and polybutadiene diamines and triamines; under conditions effective to avoid imide formation.

7. A composition as claimed in claim 6 wherein said at least one polycarboxy-functionalized prepolymer is produced by a reaction between said at least one carboxylic anhydride, said at least one polyamine, and an unsaturated carboxylic anhydride selected from the group consisting of maleic anhydride, citraconic anhydride, itaconic anhydride, phenyl maleic anhydride, and dimethyl maleic anhydride.

8. A composition as claimed in claim 1 wherein X is -NH- .

9. A composition as claimed in claim 1 wherein m is 2 or 3.

10. A composition as claimed in claim 1 wherein said elastomeric polymer is selected from the group consisting of polyalkylene ethers and polybutadienes.

11. A composition as claimed in claim 1 additionally comprising at least one thermally activatable latent hardener selected from the group consisting of dicyandiamide, guanamines, guanidines, aminoguanidines, and aromatic diamines.

12. A composition as claimed in claim 1 additionally comprising at least one thermally activatable latent hardener.

13. A composition as claimed in claim 1 wherein p is 0.

14. A composition as claimed in claim 1 wherein p is 1 or 2, n is 1 or 2 and m is 2 or 3.

15. A composition as claimed in claim 1 comprising (a) 5 to 60 weight percent of at least one polymer having at least one glass transition temperature of -30°C or lower and epoxy-reactive groups, or at least one reaction product of said polymer with at least one epoxy resin, or a mixture thereof, (b) 5 to 40 weight percent of said at least one polycarboxy-functionalized prepolymer or at least one reaction product of said polycarboxy-functionalized prepolymer with at least one epoxy resin, or a mixture thereof, and (c) 1 to 10 weight percent of at least one latent hardener.

16. A composition as claimed in claim 1 comprising an adduct of (i) a diglycidyl ether of bisphenol A, bisphenol F, or both bisphenol A and bisphenol F and (ii) the product of a reaction between:

(a) at least one carboxylic anhydride selected from the group consisting of 1,2,3-benzenetricarboxylic anhydride, 1,2,4-benzenetricarboxylic anhydride, monoesters of pyromellitic monoanhydride, monoamides of pyromellitic monoanhydride, 1,4,5-naphthalenetetracarboxylic anhydride, 2,3,5-naphthalenetetracarboxylic anhydride, 2,3,6-naphthalenetetracarboxylic anhydride, pyromellitic mono- and dianhydride, 1,8:4,5- and 2,3:6,7-naphthalenetetracarboxylic mono- and dianhydride, perylenetetracarboxylic mono- and dianhydride, biphenyltetracarboxylic mono- and dianhydride, diphenyl ether tetracarboxylic mono- and dianhydride, diphenylmethanetetracarboxylic mono- and dianhydride, 2,2-diphenylpropanetetracarboxylic mono- and dianhydride,

benzophenonetetracarboxylic mono- and dianhydride, and diphenyl sulfone tetracarboxylic mono- and dianhydride; and

(b) at least one polyamine selected from the group consisting of polyalkylene glycol diamines and triamines, and polybutadiene diamines and triamines; under conditions effective to avoid imide formation.

17. A composition as claimed in claim 1 comprising an adduct of (i) a diglycidyl ether of bisphenol A, bisphenol F, or both bisphenol A and bisphenol F and (ii) the product of a reaction between:

(a) at least one carboxylic anhydride selected from the group consisting of 1,2,3-benzenetricarboxylic anhydride, 1,2,4-benzenetricarboxylic anhydride, monoesters of pyromellitic monoanhydride, monoamides of pyromellitic monoanhydride, 1,4,5-naphthalenetricarboxylic anhydride, 2,3,5-naphthalenetricarboxylic anhydride, 2,3,6-naphthalenetricarboxylic anhydride, pyromellitic mono- and dianhydride, 1,8:4,5- and 2,3:6,7-naphthalenetetracarboxylic mono- and dianhydride, perylenetetracarboxylic mono- and dianhydride, biphenyltetracarboxylic mono- and dianhydride, diphenyl ether tetracarboxylic mono- and dianhydride, diphenylmethanetetracarboxylic mono- and dianhydride, 2,2-diphenylpropanetetracarboxylic mono- and dianhydride, benzophenonetetracarboxylic mono- and dianhydride, and diphenyl sulfone tetracarboxylic mono- and dianhydride;

(b) at least one unsaturated carboxylic anhydride selected from the group consisting of maleic anhydride, citraconic anhydride, itaconic anhydride, phenyl maleic anhydride, and dimethyl maleic anhydride; and

(c) at least one polyamine selected from the group consisting of polyalkylene glycol diamines and triamines, and polybutadiene diamines and triamines; under conditions effective to avoid imide formation.

18. A composition as claimed in claim 1 wherein said polycarboxy-functionalized prepolymer does not contain imide groups.

19. A composition as claimed in claim 1 wherein q is 2 or 3.

20. A composition as claimed in claim 1 wherein X is -NH- , q is 2, and m is 2 or 3.

21. A composition as claimed in claim 1 wherein Cy is selected from the group consisting of single aromatic rings, fused aromatic rings, and connected aromatic rings.
22. A composition as claimed in claim 1 wherein at least one $-\text{CO}_2\text{H}$ group attached to Cy is separated by two carbon atoms from the $-\text{C}(=\text{O})-$ group also attached to Cy.
23. A composition as claimed in claim 1 additionally comprising at least one hyperbranched polymer containing polyester units.
24. A thermoset composition produced by heating a curable composition as claimed in claim 1.
25. A process for adhesively bonding a first material surface to a second material surface, comprising the following process steps:
- (a) applying a layer of the curable composition as claimed in claim 1 to at least one of the first material surface and second material surfaces;
 - (b) joining the first material surface and the second material surface, with said layer of the curable composition between the first material surface and the second material surface; and
 - (c) curing the layer of curable composition by heating.
26. A process as claimed in claim 25 wherein at least one of said material surface and said second material surface is comprised of metal.
27. A process as claimed in claim 25 wherein said curable composition is additionally comprised of at least one thermally activatable latent hardener.
28. A process as claimed in claim 25 wherein said layer of said curable composition is pregelled prior to step (c).

29. A process as claimed in claim 25 wherein said layer of said curable composition is heated to a temperature of from 80 degrees C to 210 degrees C during step (c).